

Condition Monitoring for Twin-Fluid Nozzles with Internal Mixing

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Abstract : Liquid sprays of water are frequently used in air pollution control for gas cooling purposes and for gas cleaning. Twin-fluid nozzles with internal mixing are often used for these purposes because of the small size of the drops produced. In these nozzles the liquid is dispersed by compressed air or another pressurized gas. In high efficiency scrubbers for particle separation, several nozzles are operated in parallel because of the size of the cross section. In such scrubbers, the scrubbing water has to be re-circulated. Precipitation of some solid material can occur in the liquid circuit, caused by chemical reactions. When such precipitations are detached from the place of formation, they can partly or totally block the liquid flow to a nozzle. Due to the resulting unbalanced supply of the nozzles with water and gas, the efficiency of separation decreases. Thus, the nozzles have to be cleaned if a certain fraction of blockages is reached. The aim of this study was to provide a tool for continuously monitoring the status of the nozzles of a scrubber based on the available operation data (water flow, air flow, water pressure and air pressure). The difference between the air pressure and the water pressure is not well suited for this purpose, because the difference is quite small and therefore very exact calibration of the pressure measurement would be required. Therefore, an equation for the reference air flow of a nozzle at the actual water flow and operation pressure was derived. This flow can be compared with the actual air flow for assessment of the status of the nozzles.

Keywords : condition monitoring, dual flow nozzles, flow equation, operation data

Conference Title : ICCEE 2017 : International Conference on Chemical and Environmental Engineering

Conference Location : London, United Kingdom

Conference Dates : March 14-15, 2017